U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 2

July 30, 2018

BY ELECTRONIC MAIL

Robert Law, Ph.D.
de maximis, inc.
186 Center Street, Suite 290
Clinton, New Jersey 08809

Re: Re: Lower Passaic River Study Area Draft Remedial Investigation Report – Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study (Agreement) CERCLA Docket No. 02-2007-2009

Dear Dr. Law:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Remedial Investigation (RI) Report Sections 6, 7, and 10 and Appendices J, L, M, N, and O, prepared by Anchor QEA on behalf of the Cooperating Parties Group (CPG) for the Lower Passaic River Study Area Remedial Investigation/Feasibility Study. The sections and appendices were received by the EPA in January and February 2018. Partner agency comments are incorporated.

EPA is providing the enclosed comments on the CPG's revised Remedial Investigation Report with this letter in accordance with Section X, Paragraph 44(d) of the Agreement. Please proceed with revisions to the draft RI Report within 30 days consistent with the enclosed comments. If there are any questions or clarifications needed, please contact me to discuss.

Sincerely,

Diane Salkie, Remedial Project Manager
Lower Passaic River Study Area RI/FS

Enclosure
Cc: Zizila, F. (EPA)
Sivak, M. (EPA)
Hyatt, B. (CPG)
Otto, W. (CPG)

EPA COMMENTS

Lower Passaic River Study Area Remedial Investigation/Feasibility Study, Remedial Investigation Report Sections 7 and 10 and Appendix J, L, M, and N (dated January 2018) and Section 6 and Appendix O (dated February 2018)

No.	Section	General or Specific	Page No.	EPA Comment
1	Sections 6, 7 and 10 and Appendices L, M, N, and O)	General	N/A	The current level of accuracy in the models is acceptable for the RI/FS. Nevertheless, significant framework and parameter uncertainties associated with components of this complex system limit the accuracy of the models' predictions, especially related to delineating areas subject to erosion and deposition, and to surface sediment recovery trends. A high degree of caution should be applied when using those predictions to compare remedial alternatives. As additional data is collected after the FS, the models should be refined and recalibrated to incorporate the new data. This caveat about the model uncertainty, limitations, and utility, should be noted in the RI text and any relevant appendices when discussing model predictions. Furthermore, before a final remedy is selected, efforts to reduce model uncertainty for the purposes of delineating erosional and depositional areas and evaluating monitored natural recovery are required.
2	Section 6	General	N/A	As noted in the previous RI comments, please revise this section to include an evaluation of surface water quality samples in comparison to New Jersey SWQS, N.J.A.C. 7:9B (and 7:26D Subchapter 3) and National Recommended Water Quality Criteria. Figures 6-3 through 6-8 should also be revised to include the New Jersey Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B and/or National Recommended Water Quality Criteria for those contaminants/contaminant categories for which these benchmarks exist. This is necessary for appropriate perspective of environmentally-relevant conditions as observed through these RI data.
3	Section 6	General	N/A	When discussing the differential transport of different chemicals within the LPR, the term desorption should not be used by itself. The differential transport is a result of a combination of differences in the hydrophobicity, sorption rate and desorption rate. In such cases, replace references to "desorption" with "partitioning behavior" or "sorption properties" (e.g. in Section 6.1.1, paragraph after bullets, fourth sentence and in Section 6.2.1, third paragraph, last sentence).
4	6.1, first paragraph, second sentence	Specific	1	The text states that partitioning among the various water column phases is important because transport processes affect each phase differently. The text should be revised to note that partitioning among the various water column phases is also important from the standpoint of bioavailability.
5	6.1, first paragraph, fourth sentence	Specific	1	The text states: "The major components of contaminant transport are advection, dispersion, settling (or deposition), resuspension (or erosion), turbulent mixing in the water column, volatilization at the air-water interface, erosion and deposition at the sediment-water interface, and vertical mixing, diffusion, and groundwater flow within the sediment." Please make the following changes: • Add additional text (potentially as a footnote) identifying for which COPCs volatilization would be a major fate process. • Delete the phrase "erosion and deposition at the sediment-water interface" as erosion (re-suspension) and deposition (settling) are listed previously in the same sentence. • Clarify if the vertical mixing is referring to particle mixing, diffusion, or both. Processes should be treated consistently throughout the RI. If processes such as volatilization and ground water flux are described as minor elsewhere in the RI, they should not be identified as major here. Conversely, if they are truly major processes, they should be integrated into the RI models.
6	6.1, first paragraph, ninth sentence	Specific	1	The text should be revised to read: "Contaminant mobilization due to erosion is ***generally*** limited to the unconsolidated fluff layer during low-shear stress conditions and ***likely*** extends into the underlying bed during higher-shear stresses." ***(emphasis added to identify requested change)***.
7	6.1, first paragraph, last sentence	Specific	1	The text states: "This process is not well understood (Reimers et al. 2004), but in addition to consolidation, it may be biologically mediated via ingestion of fluff solids by epibenthic organisms and subsequent fecal production (Lauerman et al. 1997; Thomsen 1999; Jones et al. 2009) or the result of advective transport into the bed via hyporheic flow (O'Connor and Harvey 2008)." Please clarify if the text is suggesting that hyporheic flow results in the incorporation of solids into the sediment bed, or just the transport of contaminant.
8	6.1.1, second full sentence	Specific	3	Please provide a summary of surface water data and associated discussion to support the assertion that "exchange between sorbed and dissolved phases of these contaminants is limited during resuspension events."
9	6.2.1, first full paragraph, second sentence and Figure 6-4 and 6-5 sets	Specific	6	It appears that solids normalization generally reduces the variability in both the X and Y variables on these plots, but it does not consistently improve the variability about the 1 to 1 line. Many variables show similar magnitudes of variability before and after normalization, and many shift from one side of the 1 to 1 line to the other. This suggests that the assumption of nearly 100% sorbed concentrations (total chemical/total solids) is not valid for a number of the chemicals presented (e.g., LMW PAH and DDx in particular). The analyses presented in this section rely on the assumption that nearly all chemicals are associated with the solid phase. This assumption may not be valid across the chemicals considered. Please revise the text to recognize the limitations of this assumption.
10	6.2.1, third paragraph, fourth sentence	Specific	6	See Comment #9. The observation about solids normalized concentrations is likely due to the assumption of 100% sorbed concentrations. Please elaborate on this in the text.

No.	Section	General or Specific	Page No.	EPA Comment
11	Section 6.2.2	Specific	7 to 8	The discussion of volumetric concentrations (Figures 6-7a-f) focuses on concentrations from Dundee Dam to the ETM, and the discussion of solids normalized concentrations (Figures 6-8a-b) focuses from the ETM downstream. Please expand the discussion of both sets of figures to include the patterns across the entire LPR.
12	6.2.2, last sentence on page 7 (continued on page 8)	Specific	7 to 8	See Comments #9 and #10. Note that the LMW PAHs coming over Dundee Dam are nearly constant on a volumetric basis. Solids normalization results in greater variability. The conclusions reached may be influenced by the assumption of nearly 100% sorbed concentrations (total chemical/total solids) for chemicals that may not be predominantly particle bound (e.g. LMW PAH and DDx). Please elaborate on how this affects the conclusions on distribution trends for different chemicals in the text.
13	6.2.2, first and second full sentences	Specific	8	While the Total PCB and DDx distributions are fairly flat through Newark Bay, the LMW PAH shows a flat to increasing pattern across the bay, and the mercury pattern is more similar to the 2,3,7,8-TCDD pattern than the flatter Total PCB and DDX patterns. Please revise the text accordingly.
14	6.2.3, last sentence on page 8 (continued on page 9)	Specific	8 to 9	The February/March 2013 (sampling during the rising limb to a peak of ~3000 cfs then sampling during the falling limb) and June 2013 (sampling during the first half of the rising limb to half peak [~3000 cfs] then sampling during the falling limb [from the peak of about 6000 cfs]) high flow events did not use the same sampling approach as the other datasets (Flood-slack-ebb-slack). Please discuss the implications of this sampling approach on the data interpretation and conclusions presented in the text.
15	6.2.3, second paragraph, sixth sentence	Specific	9	Please clarify if “water column flux” is referring to the flux of contaminant from the bed to the water column, the longitudinal flux of contaminants in the water column, or both.
16	6.2.4, first paragraph, second and third sentences	Specific	9	Under typical flow conditions the ETM is generally located further upstream than the RM 1 to 7 reach noted here. See estimated salt front location and solids concentrations for the CWCM events presented on Figure 6-8b and the salt front location under general conditions presented in Figure 6-12 and Appendix M Figure 5. If the RM 1-7 reach was chosen for the surface sediment concentration comparisons because the majority of the water column measurements are in this reach, that should be stated, rather than the including reference to the ETM location.
17	6.2.4, third paragraph, second sentence	Specific	10	See Comments #9, #10 and #12. Partitioning behavior may contribute to the observed LMW PAH and mercury patterns. Please revise the text to consider the potential impact.
18	6.2.4, last paragraph	Specific	10	The discussion of the difference in contaminant concentrations on bed sediment versus water solids includes the possibility of resuspension from areas with the most elevated concentrations blending with resuspension from low-concentration areas. Please clarify how solids entering from above Dundee Dam and other external sources are considered in this mixing process.
19	6.2.4, numbered list	Specific	11	The numbered list presents factors that may be contributing to the noted differences between water column particulate concentrations and the 0 – 6 inches sediment concentrations. In addition to the factors listed, mixing within the water column should be included. Vertical and horizontal mixing within the water column may account for differences in variability between water column particulate concentrations and bedded sediment concentrations.
20	6.2.4, last paragraph	Specific	11	The model calibration was targeted to reflect the observed relationship between the water column and 0 – 6 inch sediment data. The gradients observed in the data cannot then be supported by the model. Please revise the text to state that the observation is consistent with the model calibration presented in Section 7.
21	Section 6.2.5	Specific	12	Please add summary tables for the statistics cited in the discussion or point to the relevant table numbers in Appendix H.
22	6.3.1, fourth paragraph, first sentence	Specific	13	The upstream inventory is also a function of the volume or mass of solids deposited since the time of the discharges. This volume is greatest downstream where the wider channel was dredged to a deeper depth and smallest upstream where the narrower channel was dredged to a shallower depth. The upstream decline is a function of smaller surface area, the decreasing thickness of the deposition post dredging, and declining potential for upstream contaminant transport and trapping. Please revise the text accordingly.
23	6.3.1, first full sentence	Specific	14	As written, this sentence sounds as if the period of deep LPR depths occurred when Newark Bay was also deepened. Please revise to state: “but this effect is uncertain as it may have been offset by ***shallower depths in Newark Bay prior to the*** deepening of the channel in lower Newark Bay and the Kills associated with the Harbor Deepening Project, which has had a pronounced effect on circulation and solids loading to Newark Bay”. ***(emphasis added to identify requested change)***
24	6.3.1, first paragraph, last sentence	Specific	14	The discussion points to the decreasing fine sediment fraction moving upstream and highlights the navigation channel in particular. A second set of points should be added to Figure 6-13 to present the fine sediment fraction results from within navigation channel separately.

No.	Section	General or Specific	Page No.	EPA Comment
25	6.3.1, first full paragraph	Specific	14	This paragraph presents a contradiction that warrants further discussion. The first half of the paragraph notes that the 2,3,7,8-TCDD distribution downstream of RM 2 reflects more favorable trapping conditions associated with the expanded cross sections of the lower reaches of the LPR and upper Newark Bay. However, the second half of the paragraph discusses the declining 2,3,7,8-TCDD mass inventory downstream of RM 2. Additional discussion of the more favorable trapping conditions and higher fines content downstream of RM 2 relative to the declining 2,3,7,8-TCDD mass inventory downstream of RM 2 should be provided. The 2,3,7,8-TCDD mass inventory downstream of RM 2 should be contrasted with other contaminants such as HMW PAHs and total PCBs which show an increase in total mass within Newark Bay. Please revise the text accordingly.
26	Figure 6-1	Specific	N/A	Please include porewater advection as a fate process. Add a label to mixing within the water column for consistency.
27	Figure 6-2	Specific	N/A	The data on this figure are different from the 2015 Draft RI. Please check and verify the source of the differences.
28	Figure 6-3	Specific	N/A	It appears that the labels in the legend are switched. Please correct.
29	Figure 6-5d	Specific	N/A	The left and right panels should have the same number of log cycles.
30	Figures 6-6a-f	Specific	N/A	It appears that some of the Round 1, routine sampling data at RM 17.5 are missing. Please check these figures (Figures 6-6a-f) and correct them as necessary.
31	Section 7	General	N/A	When resubmitting the RI, all results presented in Section 7 and the associated Appendices L through P must be updated to reflect the changes that were made to the suite of models after the January 2018 draft submission of the RI Section 7. Any changes to an individual model should be carried through all subsequent models.
32	Section 7	General	N/A	When presenting time series model results please clarify if they do or do not include the reset in sediment concentrations incorporated in the short-term calibration.
33	7.1, footnote 2	Specific	2	Add text to clarify that the reference is to Figure 34 of Appendix M.
34	7.1, last paragraph, last sentence	Specific	3	Please revise this text to reference the comparison of the OC model to data rather than the FFS model.
35	7.1, bulleted list	Specific	4	Revise this list to be consistent with the listed modifications and order presented in Appendix O Section 2.1.
36	7.1, second bullet	Specific	4	Revise the statement “observed benthic biomass density patterns” to clarify that this is referring to literature values and not site-specific data.
37	7.1, footnote 5	Specific	4	As stated, only a limited number of contaminants were modeled, and risk calculated from the modeled contaminants represent only a portion of the total risk. Please revise the RI report to document how total risk will be calculated using the subset of COPCs modeled (i.e. accounting for risk associated with contaminants that were not modeled). Alternatively, the series of memos related to the selection of COPCs and how totals will be calculated from them will have to be combined into a document, which can be reviewed, approved, and cited in the RI.
38	7.1, first paragraph, first full sentence	Specific	5	Please revise this sentence to indicate that some of the FFS model boundary condition concentrations for individual chemicals and locations were modified, and where details of how they were modified can be found in the RI documentation.
39	7.1, second paragraph	Specific	5	The text states: “…a benthic invertebrate community downstream of RM 6 that primarily uses the top 10 cm of the sediment bed, and upstream of RM 6 that primarily uses the top 2 cm of the sediment bed; a fish community that is dominated by benthic fish; and the influence of urbanization on the LPRSA food web.” This text must be removed or revised as it is not representative of the bioaccumulation model currently being developed. Please see the Dispute Resolution Decision issued by Walter Mugdan to the Cooperating Parties Group (CPG), by letter dated June 28, 2016, with the subject line: “Dispute Resolution - EPA Decision Pursuant to Administrative Settlement Agreement and Order on Consent for the RIFS, USEPA Region 2 CERCLA Docket No. 02-2007-2009,” concerning the Region’s direction to the CPG to use data from the top 15 cm of sediment to represent contaminant concentrations applicable to the biological exposure depth.
40	7.1, footnote 6	Specific	5	The reference to feeding in the top 2 cm should be deleted in this footnote because it is not representative of the bioaccumulation model being developed. See Comment #39.

No.	Section	General or Specific	Page No.	EPA Comment
41	Section 7.2	General	N/A	Consistent with EPA's 2017 memorandum on remediating contaminated sediment sites, model framework and parameter uncertainties should be identified as potential sources of forecast inaccuracy that may limit the quantitative reliability of models. Both framework uncertainty and parameter uncertainty are substantial for the models, due to the complexity of the system and certain data limitations. Notable examples of framework uncertainty include the physical representation of the fluff layer and assumed differences in resistant and reversible contaminant sorption/desorption for each contaminant and each respective sediment layer and the difference in scale, between fine-scale areas of erosion and sedimentation as observed in bathymetric surveys, versus the larger-scale cells used by hydrodynamic and sediment transport models (See Comment #76). Examples of parameter uncertainty include the uncertainty in erosion parameters (i.e., critical shear stress and erodibility), as it relates to the use and adaptation of data obtained with Sedflume. Overall, the limited accuracy of the models' predictions of erosion and deposition and of risk reduction over time due to the complexity of the system and certain data limitations should be considered when making regulatory decisions for the Lower Passaic and Newark Bay. In addition, data to establish 1995 initial conditions and calibration targets are limited to lower 8-mile surface sediments and long-term water column trend data are not available, so that only a short-term calibration (spanning 2011-2013) could be performed. These factors render the long-term calibration especially uncertain with respect to long-term surface sediment trends for the upper 9 miles, and with respect to long-term water column contaminant trends throughout the site. Long-term calibration to only one medium (sediment) and for only a portion of the site (RMs 0-8) limits the ability of the models to accurately predict long-term trends in chemical exposure via all media at all locations. The discussion of uncertainties in the models should also note the effect of these uncertainties on remedial decision-making. The STM simulates a much more stable sediment bed than was actually observed in bathymetric surveys. As a consequence, simulations of remedial alternatives using the models may under-predict the extent to which sediments erode and redeposit under a range of normal flow conditions. In addition, the models tend to over-predict recovery in depositional areas and cannot reliably distinguish areas of erosion from areas of deposition at the scale of a model cell. Although the modeling appendices do discuss these uncertainties including under-predictions and over-predictions, uncertainties in model predictions should be discussed in the main RI text body, i.e. as a new sub-section in Section 7.2 or in relevant sub-sections existing in Section 7.2. The language added to Section 7.2 could also refer to the discussions in the appendices. Language should also be added to address how these uncertainties would affect remedial decision-making, especially for the upper 9 miles.
42	7.2.2.1, last sentence	Specific	6	Clarify the reach considered "upstream". 29 KMT is at RM 14.8, but CSOs are first shown between RM 14.8 and 8. On Figure 7-2a, tributaries total 6,200 MT vs. 6,400 MT in text. Please correct as necessary.
43	7.2.3.1, bullet number 5	Specific	9	Given the magnitude of the deposition and erosion fluxes, it is not clear what fraction of the load entering at Dundee Dam reaches RM 8. The description could be misinterpreted to mean that none of the chemical from Dundee Dam is lost to the bed and replaced by resuspended contaminants between Dundee Dam and RM 8. Please revise the text to compare the magnitudes of the fluxes without implying information that cannot be determined from the current model simulations. Alternatively, a component simulation could be conducted to determine the fate of the load of tetra-PCBs from Dundee Dam.
44	7.2.3.1, second paragraph after bullets, third sentence	Specific	10	Please clarify the statement "Cumulative upstream and downstream fluxes at RM 8 and RM 2 are of similar magnitude but with a net downstream flux" (e.g. is it intended to mean that the net downstream fluxes are small differences of larger gross fluxes?).
45	7.2.3.1, second paragraph after bullets, sixth and seventh sentences	Specific	10 to 11	Please clarify whether these statements apply to the "full period considered" (as in the previous sentence) or to only the low flow period.
46	7.2.3.1, second full paragraph, last sentence	Specific	11	Any change in the navigation scour, including eliminating it, would result in changes in the erosion, deposition, and transport terms as well. Statements about what the net exchange would be in the absence of navigation scour should be eliminated or modified to recognize that changing any of those terms would result in changes to all of them.

No.	Section	General or Specific	Page No.	EPA Comment
47	Section 7.2.3.2	Specific	12 to 13	This section overstates the recovery of surface sediment concentrations by presenting predicted recovery trends, rather than the slower recovery seen in RM 0-7 data. Although the last paragraph in this section notes that the extent of recovery due to net deposition may be exaggerated in some cells of the model, this point should be emphasized and included in the discussion of model uncertainty in the main body of the RI Report. For example, Appendix O and associated Figures 4.2.1-b and e (comparison of CFTM model results to actual data) show little apparent recovery in surface sediment 2,3,7,8-TCDD concentrations for the 1995-2009 period for all three erosion/deposition categories while the simulations show more rapid recovery between 1995 and 2009 for areas categorized as depositional (Comment #103). The text should be revised to emphasize that trends in this section are drawn from the model simulation and may be different than the trends of the actual data. The text should also expand upon the discussion of the uncertainty in the model results. The model generally under-predicts concentrations and over-predicts rates of recovery in depositional areas. Those depositional areas are the source of most of the recovery observed in the figures presented in this section.
48	7.2.3.2, second paragraph	Specific	13	The text states: "The above trends in model predictions are qualitatively consistent with the estimates of recovery based on data presented in Section 10, which indicates that widespread recovery is primarily observed in depositional areas." However, modeling trends and the trends discussed in Section 10 cannot be easily compared for the following reasons: 1. Trends in long-term modeling predictions were developed for period selected as typical (Water Year 1995 – Water Year 2010), whereas the period used in Section 10's data compilation (1995-2011) was selected to reflect the effects of the most extreme event in the simulation period, Hurricane Irene (See Comment #74). 2. Modeling trends were averaged across depositional vs. erosional model cells, whereas data shown in Section 10 were grouped according to finer-scale bathymetric measurements. The data presented in Section 10 reflect deposition at a much finer spatial scale than the model can represent and the trends they show may be dependent on an extreme event and not generally applicable. The modeling trends discussed in Section 7.2.3.2 should instead be compared to data from long-term calibrations such as in Appendix O. This would provide a more appropriate test of the accuracy of the models' simulations of recovery. The model to data comparison discussion in Section 7.2.3.2 should then be revised as appropriate.
49	Section 7.2.3.3	Specific	13 to 14	Text should be added to explain how solids-normalized contaminant concentrations in the fluff layer (Figures 7-23a,b and 7-24a,b) can be lower than concentrations in the water column layer above the fluff layer and in the 2 cm layer below the fluff layer. In meetings with the EPA modeling team, the CPG has offered the explanation that the solids concentrations used to normalize the chemical concentration in the fluff layer are approximate, but the chemical mass in the fluff layer and the transfer of that mass to and from the adjacent layers is handled appropriately. Without an understanding of the effect of the approximate treatment of the solids mass in the fluff layer, a reader may conclude that the results presented in Figures 7-23 and 7-24 indicate a problem in the contaminant mass transport. Please expand the text to incorporate a discussion of the approximate nature of the fluff layer concentration and the impact on model behavior.
50	Figures 7-4, 6, 8, 12, 14, and 16	Specific	N/A	Figures presenting solids (7-4a-c, 7-6a-c, 7-8a-c) and contaminant (7-12a-b, 7-14a-b, 7-16a-b) loads for different flow conditions would be easier to compare if the mass transport were normalized by time, as presented for full simulation period (7-2a-c and 7-10a-c). This would simplify the comparison to the loading rate as a function of flow condition, rather than duration and flow condition. Please revise these figures to present mass per time values. For all mass balance figures please make sure that the water column fluxes represent the total Flux (advection + dispersion + Smolakiewicz correction), that the figures identify any mass that was added due to negative solutions (if greater than a zero using the same units as the figure), and any change in the water column mass is presented. This will allow the reader to confirm that the mass balance closes.
51	Figure 7-21	Specific	N/A	Please use consistent scales on the two reaches presented on this plot and add the sediment data to these figures.
52	Section 10	General	N/A	This section presents a summary of empirical data used to evaluate natural recovery processes within the Lower Passaic River. The report should include a discussion of how the empirical lines of evidence will be used in conjunction with the conceptual site model and contaminant fate and transport model to evaluate natural recovery for the purpose of developing a remedial strategy for the site. This summary should discuss sources, spatial patterns of natural recovery and the use of predicted sediment, surface water and tissue concentrations.
53	Section 10	General	N/A	In Section 10.4.1, the text discusses the impact of Hurricane Irene on differences in sediment concentrations collected prior to the hurricane (2008, 2009, and 2010) and after the hurricane (2012 and 2013). Given this observation, data comparisons used in the discussion of natural recovery and the impact of Hurricane Irene should not group data before and after the hurricane together. The text and figures of Section 10 should be revised to consistently present the ~1995, pre-Irene, and post-Irene data separately.

Lower Passaic River Study Area Remedial Investigation/Feasibility Study, Remedial Investigation Report Sections 7 and 10 and Appendix J, L, M, and N (dated January 2018) and Section 6 and Appendix O (dated February 2018)

No.	Section	General or Specific	Page No.	EPA Comment
54	Section 10, first paragraph, second and third sentence	Specific	3	Regarding natural recovery, the text states: "It is facilitated by net deposition or oscillating erosion and deposition. It is inhibited by net erosion in areas with higher surface sediment contaminant concentrations and by external contaminant loadings." Please rephrase the text to incorporate the following: • The text should note that oscillating erosion and deposition in areas of elevated sediment concentrations can also inhibit natural recovery due to the lack of consistent deposition of cleaner material over time. • For clarity, the text should note that net erosion of contaminated sediments and subsequent transport of those eroded materials within the LPR system inhibit recovery (in addition to external contaminant loadings). • For clarity, the text should specify that these are the relevant natural recovery processes at the Passaic River (and not the universe of natural recovery processes that may be present at other sites).
55	Section 10, first paragraph, fifth sentence and sixth sentences	Specific	3	The text states: "However, from the mid-1990s to roughly 2010, the average surface sediment concentration in the lower 8 miles of the LPRSA declined at an almost imperceptible rate." This statement should be expanded to include the entire 17-mile reach of the Lower Passaic River. In addition, please provide a discussion in the text that focuses on changes in contaminant concentrations since 2010 and the processes that contribute to these changes. The text continues: "The lack of an overall contamination concentration decline in the lower 8 miles of the LPR likely reflects the impact of Hurricane Irene and other high-flow events…" Hurricane Irene occurred in 2011 so that the lack of recovery seen in data through 2010 cannot be attributed to that event. Revise the text to clarify the explanation.
56	10.1, first paragraph	Specific	3	This section should include a paragraph that discusses the factors that inhibit natural recovery. For example, while erosion removes mass from a location, it can expose more-highly contaminated sediment, resulting in a local increase in surface concentration and has the potential to increase surface concentrations in areas where the eroded sediment re-deposits.
57	Section 10.1, second paragraph, first sentence	Specific	3	The first sentence should be revised to read: "***~~Residual~~ Ongoing*** contaminant loads ***from external sources can limit natural recovery ~~entering the river can slow recovery and eventually control it~~***." ***(emphasis added to identify requested change)*** Residual loads should be referred to as external loads throughout this section for clarity.
58	10.1, second paragraph, third sentence	Specific	3	Please revise the statement to read as follows (or something similar): "When residual loads are not significant, recovery is controlled by internal sources, and widespread recovery depends on the decline of concentrations in those LPR sediments that have the strongest influence on water column contaminant concentrations ***and/or those sediments prone to erosion and transport within the LPR system***." ***(emphasis added to identify requested change)***. In addition, change "residual loads" to "external loads".
59	10.1, first paragraph, first sentence	Specific	4	The report notes that deposition and erosion are strongest during high-energy events. This concept should be expanded upon by discussing the falling and rising limbs of the hydrograph during high flow events and the effect on contaminant concentrations in bedded sediments and the water column. During the rising limb, sediment erosion increases in response to rising shear forces. During the falling limb, deposition increases as suspended sediments settle out of the water column.
60	10.1, first paragraph, third sentence	Specific	4	Please revise the statement to read: "Although tidal currents induce deposition and erosion continually in ***much of*** the LPR and induce transport of solids and contaminants…" ***(emphasis added to identify requested change)***
61	10.1, second paragraph	Specific	4	As requested in previous EPA Comment #278, please revise this paragraph to provide a discussion of any studies quantifying contaminant load in porewater seepage and its relative importance or state that such studies do not exist.
62	10.1, footnote 1	Specific	4	Please clarify if deposition during the falling limb of the hydrograph is considered in this statement.
63	Section 10.2	Specific	4	This paragraph presents total solids loading and export. The report should clarify that these estimates represent annualized averages based on the sediment transport model.
64	10.2.1, first sentence	Specific	4	Please revise the statement to read: "Reflecting the limits on upstream transport and the coarseness of the sediments, ***~~contaminant~~*** concentrations ***for many contaminants*** decline moving upstream of RM 12 to RM 14, with the decline being greatest in the absence of an upstream and/or direct source…" ***(emphasis added to identify requested change)***
65	10.2.1, last paragraph, first sentence	Specific	5	The text states that upstream and downstream sources of all contaminants except 2,3,7,8-TCDD may cause recontamination of the system upon remediation. This statement is an over generalization and should be revised to consider the effect of recontamination relative to cleanup levels and the potential for future efforts to control point and non-point source discharges within the Lower Passaic River watershed.

<table>
<tr><th>No.</th><th>Section</th><th>General or Specific</th><th>Page No.</th><th>EPA Comment</th></tr>
<tr><td>66</td><td>Section 10.2.2</td><td>Specific</td><td>6</td><td>Based on Figures 10-3a through f, a qualifier should be added as to the relative magnitude of the tributaries as contaminant sources. First, there is limited data in the tributaries. Second, with the exception of Saddle River, the observed sediment concentrations within the tributaries seem to be at or below what is seen in the LPR for many constituents. Section 10.2.2 should be revised to better reflected these observations from the figures. The following statement, in particular needs to be re-evaluated: “Concentrations of the remaining contaminants upstream of the tributary HOT are generally comparable or higher than levels in the LPR near the confluence, suggesting the tributaries could be local sources.” (emphasis added in italics)</td></tr>
<tr><td>67</td><td>10.2.3, footnote 4</td><td>Specific</td><td>6</td><td>The footnote mentions solids loads but should reference contaminant loads to support the statement that CSOs and SWO’s are not a significant source of contaminants.</td></tr>
<tr><td>68</td><td>10.2.3, first paragraph second sentence</td><td>Specific</td><td>7</td><td>Please revise the statement to read: “USEPA concluded in 2008 that chemical inputs <s>to streams</s> from groundwater discharges are negligible throughout the LPR …” (emphasis added to identify requested change)</td></tr>
<tr><td>69</td><td>Section 10.2.3, first paragraph, fourth sentence</td><td>Specific</td><td>7</td><td>Statements regarding the Great Swamp areas from the Chatham Township Natural Resource Inventory should be linked to the LPR with a more detailed discussion of how these conclusions inform the understanding of groundwater migration in the LPR. Otherwise, statements such as the referenced sentence should be deleted.</td></tr>
<tr><td>70</td><td>10.2.3, first paragraph, fifth sentence</td><td>Specific</td><td>7</td><td>Please add some discussion of the measured seepage velocities observed during the RM 10.9 Ultra Seep investigation.</td></tr>
<tr><td>71</td><td>10.3</td><td>Specific</td><td>8</td><td>Figures 10-4 through 10-6 provide excellent empirical evidence that natural recovery is occurring in depositional areas of the Lower Passaic River. The discussion presented in Section 10.3 should be augmented to discuss the percentage of areas identified as depositional and any uncertainties associated with the spatial coverage of the data set (e.g., the data was collected primarily within the navigation channel downstream of RM 7). A figure that illustrates the area covered by the data analysis and percentage of the various erosion/deposition categories should also be included. As is noted in the report, no recovery is inferred if all data is grouped together. However, understanding where deposition is effective at reducing TCDD surface concentrations, where natural recovery is not occurring due to the lack of deposition, and where erosion of contaminated material represents an ongoing internal source of contamination to the Lower Passaic River will be a key component of the remedial strategy for the site.</td></tr>
<tr><td>72</td><td>Section 10.3, second through fourth bullet points</td><td>Specific</td><td>8</td><td>The text uses observed changes of at least 6 inches from 1995-2011 to define depositional and erosional areas, and smaller changes, which are insignificant relative to the error in the bathymetric measurements, to define “No Measurable Change” Areas. The distribution of areas in RM 1-7 according to the above defined categories is presented as 32% erosional and 36% depositional.

However, areas that are defined as depositional and erosional on this basis are not necessarily depositional and erosional at all times, and in fact much of the LPR sediment bed is alternatingly depositional and erosional, as Appendix M Attachment B shows. Characterization of areas as erosional and depositional based on a single pair of surveys, as is done in Section 10.3, overstates the consistency of erosion and deposition and without recognizing cyclical behavior. Although Section 10 notes the role of “oscillating erosion and deposition” in its first sentence, this cyclical behavior is neglected in the discussion of Figure 10-6, instead categorizing areas as erosional or depositional, whereas cyclical erosion and deposition appears to be more prevalent than either consistent erosion or deposition (see Table 1 below). For example, the percentage of the LPR that was consistently depositional between 2010 and 2012 was 10% while the percentage of areas that were consistently erosional was 5%.

Table 1: Lower Passaic River Surface Areas Experiencing Successive Deposition and Erosion for 2010-2011 and 2011-2012 Periods, adapted from Appendix O Attachment B Table 4-5
<table>
<tr><td>2010-2011</td><td>2011-2012</td><td colspan="2">Percent of LPR Surface Area</td></tr>
<tr><td rowspan="2">Deposition</td><td>Deposition</td><td>10%</td><td rowspan="2">37%</td></tr>
<tr><td>Erosion</td><td>27%</td></tr>
<tr><td rowspan="2">Erosion</td><td>Deposition</td><td>10%</td><td rowspan="2">15%</td></tr>
<tr><td>Erosion</td><td>5%</td></tr>
<tr><td colspan="2">Non-detectable</td><td colspan="2">48%</td></tr>
</table>
The text and Figure 10-6 should be revised incorporate a cyclical erosion and deposition category to compare to successive deposition and successive erosion categories as represented in Table 1 above.</td></tr>
</table>

No.	Section	General or Specific	Page No.	EPA Comment
73	10.3, second paragraph and Figures 10-5 and 10-6	Specific	8	Figure 10-6 error bars show significant overlap between data sets. Please include a discussion of the uncertainty associated with comparing the 1995 and 2010 datasets.
74	10.3, footnote 8 and Figure 10-6	Specific	8	Section 10.3 bases its demonstration of surface sediment recovery on a long-term period that ends with an extreme high-flow event (the period 1995 to 2011), instead of the more representative long-term period (WY 1995 to WY 2010) that was used to calibrate the contaminant fate and transport model. Instead of using modeled bathymetric change from Water Year 1995 to Water Year 2010 to distinguish areas of deposition and erosion, as was done in Appendix O, the trends in Figure 10-6 depict areas of erosion and deposition as seen immediately after the most extreme flow event in the simulation period, rather than representing the cumulative effect of more typical long-term changes. The end year should instead be modified to 2010 to more accurately reflect the effects of typical long-term changes and the Section 10.3 discussion should be revised as appropriate. Footnote 8 and Figure 10-6 should also then be updated. In addition, an evaluation of uncertainty in the surveys and estimation of sediment bed elevation change based on the surveys should be provided in this section or (if located in a different section of the RI) properly referenced.
75	10.3, footnote 9	Specific	8	Further discussion of potential bias introduced by inclusion of the 2012 SSP data set when comparing 1995 and “2010” data should be provided and supported by identifying where the 2012 data fall among the bathymetry change categories and within the concentration range of each category.
76	10.3	Specific	8 to 9	By using bathymetric survey data rather than modeled changes, Section 10.3 shows trends on a finer scale than can be represented with the model grid. This difference in scale, along with differences in end dates (2010 vs 2011), may explain the difference between simulated surface sediment recovery for depositional areas and the chemical concentration data that show very little recovery in modeled depositional areas. While the data demonstration in Section 10.3 is suggestive of recovery processes that may occur locally after extreme events, it does not validate the models’ ability to accurately represent long-term recovery. The report should discuss the effect of the choice of time periods for bathymetry changes and contaminant data sets on variability in estimated recovery rates.
77	Section 10.3, first full paragraph and Figure 10-8	Specific	9	The paragraph compares carbon-normalized 2,3,7,8-TCDD concentrations in sediment (from areas with dry-weight concentrations in the range of 100-200 ppt) with concentrations measured in bottom water at RM 10.2, and references Figure 10-8. Since the text focuses on mean concentrations, Figure 10-8 should be revised to include mean concentrations. The figure should also be improved by presenting both panels with the same y-axis scale and adding data from the left hand panel to the right hand panel as a cumulative frequency distribution (CFD). Comparison of the two CFDs should be discussed, in addition to the means, and may provide some insight into the response time of the sediment bed.
78	10.4.1	Specific	10	Based on Figure 4.1-2, there appear to be two other relatively high flow events between 2010 and 2012 besides Hurricane Irene. Please revise the text of this section to acknowledge these flow events.
79	10.4.1, first sentence	Specific	10	Regarding “The impact of a rare high-flow event like Hurricane Irene is analyzed in Figure 10-20a, which compares 2,3,7,8-TCDD concentrations in surface sediment collected before Irene with those collected after Irene.” For clarity, provide additional text that notes what recurrence event flow (e.g., 5-year, 25-year, etc.) Hurricane Irene caused within the LPR.
80	Section 10.4.1, first full paragraph, fifth sentence	Specific	11	Characterizing the post-Irene distribution as significantly lower than 30% of the pre-Irene distributions overstates the fraction of the distribution to which the statement applies. A more appropriate characterization of the fraction of the distribution that is lower would be 20 to 25%, depending on the difference considered significant. Please modify the text and state the difference (e.g. x percent of the distribution is lower by y percent).

No.	Section	General or Specific	Page No.	EPA Comment
81	Section 10.5, last paragraph, first sentence to third sentence	Specific	12	Regarding the first sentence, please delete the assertion of what is a "preferred" comparison because there are strengths and weaknesses associated with both the wet weight comparison and the lipid normalized comparison. Furthermore, although it is true that uncertainty in percent lipid concentrations may affect lipid normalized sample results, the use of lipid normalized results is valuable because it considers seasonal variations in feeding behavior and diet. As noted in Sediment Assessment and Monitoring Sheet #1 – Using Fish Tissue Data to Monitor Remedy Effectiveness (EPA 2008), lipid data can be a measure of the health or status of an organism. Individuals with low lipid contents may be unhealthy, starved, or may have recently lost lipid-soluble contaminants due to egg laying. In addition, as many COPCs being examined in this study are lipophilic, organisms with higher lipid content would be expected to have higher concentrations. This affects the interpretation of historic trends. This also helps control for organism size/age which otherwise is not controlled in this analysis. (If large older fish were caught in the historical data and small younger fish were caught in the more recent data this would show a significant decline in concentrations, but this would be an artifact rather than a true trend.) To some degree, lipid normalization can also control for skin-on vs. skin-off differences. These factors suggest that examining lipid-normalized trends would be a valuable method of comparison. A discussion of the uncertainties associated with lipid normalization such as differences in analytical methodology and uncertainty in the testing method as well as the benefits associated with lipid normalization should also be provided. Regarding the second sentence, it is true that there is more uncertainty in the historical lipid data than the contemporary data. However, there is also more uncertainty in the historical wet-weight contaminant data. The report should demonstrate evidence that the uncertainty in the historic lipid data warrants the exclusion of these data from the analysis. In many cases, historical data show higher lipid contents than more recent data. Is the report asserting that older methods overestimated lipid content, or that modern methods do not effectively capture the extent of lipids in organisms? Evidence for either assertion must be provided; and all lipid-normalized data must be presented regardless. Regarding the third sentence, to omit lipid-normalized concentrations of mercury when there is a difference in lipid fraction is essentially the same as omitting lipid normalized data comparisons. Although lipid normalization for chemicals that are not lipophilic has limited benefit, for lipophilic compounds, differences in lipid fractions are expected to have a significant effect on wet weight concentrations. The RI report should not censor the data set in this manner and must show all lipid-normalized comparisons in its figures, including eel, white perch, and blue crab. Comparisons of tissue data with substantially different lipid fractions should not be excluded.
82	10.5, American eel bullet, second sentence	Specific	13	The text states (regarding skin on vs. skinless fillets): "...this difference would not be anticipated to greatly impact the comparison of wet-weight concentrations" Analyses done for other sites have showed that skin-on fillets can have a factor of two times higher contaminant concentrations on a wet-weight basis than skin-off fillets due to the higher lipid content in the skins and surrounding tissues. A ratio of approximately two was also found between raw skin on fillets and skin-off fillets in Zabik et al., (1995). [Zabik, M. E., Zabik, M. J., Booren, A. M., Nettles, M., Song, J.-H., Welch, R., and Humphrey, H. (1995). "Pesticides and total polychlorinated biphenyls in chinook salmon and carp harvested from the Great Lakes: effects of skin-on and skin-off processing and selected cooking methods." Journal of agricultural and food chemistry, 43(4), 993–1001.] Unless literature or data evidence can be provided, remove "this difference would not be anticipated to greatly impact the comparison of wet-weight concentrations" and discuss the potential higher concentrations in skin-on fillets due to lipid content.
83	10.5, Mummichog bullet	Specific	14	The results of calculating 2,3,7,8-TCDD in mummichog mean concentrations with and without the 1999 outlier data has been added to Figure 10-21. However, the previously requested (previous EPA Comment #289) text discussing the potential impact of Tropical Storm Floyd (which occurred just 1 month before the 1999 outlier data) on contaminant bioavailability has not been added to the text. Please revise to incorporate this discussion.

No.	Section	General or Specific	Page No.	EPA Comment
84	10.5, White perch bullet, second sentence	Specific	14	The text states: "In addition, historical data were analyzed as skinless fillets, while recent data were analyzed as skin-on fillets; however, this is not anticipated to greatly impact the wet-weight concentrations." See Comment #82. The EPA team would have a different anticipation, so evidence must be provided for this assertion. In addition, previous EPA Comment #291 noted the following: for white perch especially, the age of the organism can have a large effect on the degree of bioaccumulation, and this does not appear to have been accounted for in this analysis. The evaluation should take into account the age of the organism.
85	10.5, last two bullets	Specific	15	The report should discuss the ability of the various species sampled to metabolize PAHs and the potential effect on the tissue concentration trends and not that metabolization of PAHs may confound any spatial relationship between sediment concentration trends and tissue concentration trends.
86	10.5, last paragraph, first sentence	Specific	15	The text states: "The finding that recovery in surface sediments is evident only in areas subject to net deposition (Section 10.3) seems at variance with the more general recovery observed for fish and blue crab." Once lipid-normalized data for all species have been provided, reassess the "general recovery" and provide a more balanced discussion here. See Comment #81.
87	10.5, last paragraph	Specific	15	The evaluation of fish tissue concentration trends presented in Figures 10-21 through 10-26 and Table 10-2 show a large degree of variability which inhibits any definitive conclusions regarding trends in tissue concentrations. This variability may be due to the number of samples, the timing of the sampling, species sampled, metabolization of PAHs and other factors. The report should include a more detailed summary of the uncertainty in the evaluation of the tissue concentration trends including whether the changes summarized in Table 10-2 are statistically significant or not.
88	Figure 10-2	Specific	N/A	Please expand the legend note "* Means are statistically different" to clarify which means are being compared.
89	Figure 10-3	Specific	N/A	The legend note, "Plots include data within 500 ft of tributary confluence at LPR Sample River Mile of -0.2." needs to be clarified (i.e. clarify whether the blue LPR samples are taken within a 500 foot or a 0.2 mile [1000 foot] radius of tributary confluence).
90	Figures 10-19a & b	Specific	N/A	Please indicate if differences in means are statistically significant.
91	All Appendices	General	N/A	Select spelling and grammar errors and inconsistencies are pointed out in the comments below but please perform a spelling and grammar check throughout the appendices to be thorough.
92	Appendix J	General	N/A	Similar mapping and analysis methods were used for TCDD and other primary COPCs. Please include a set of figures comparable to Figures 3-2, 3-3 and 3-4 showing how concentrations of the other primary COPCs vary with the selected stratification based on erosion and deposition. Since the mapping for secondary COPCs use the same groupings as the primary COPCs, when documentation for the secondary COPCs is submitted, please include figures similar to Figures 3-2 through 3-4.
93	Appendix J	General	N/A	Appendix E is planned to be reissued and the reissue has not yet been made by the CPG. Please ensure the "2010 dataset" referenced in Appendix J (requested in the 2015 Draft RI Comment #358) is included as part of Appendix E.
94	Appendix L through O	General	N/A	The combination of CPG models appear to predict a more rapid natural recovery in strongly depositional areas than is suggested by the data presented in modeling appendices figures. The underlying factors that contribute to this miscalibration need to be investigated and corrected prior to use as a management tool. In the response to comment (RTC) on 2015 Draft RI Comment #386, the CPG argues that model bias only remains in the lower 2-3 miles of the river thus the utility of the models will not be affected since the Lower 8 Mile ROD will be implemented downstream of River Mile 8.3 regardless of model results. However, it is clear that more model biases exist than just in the lower 2-3 miles of the river. See Comments #95, #96, and #103.
95	Appendix M	General	N/A	The Sediment Transport Model (STM) generally under-predicts erosion and deposition under historical flow conditions, overstating sediment stability. The STM generally preforms better in simulating erosion and deposition for extreme events like Hurricane Irene than for more typical flow conditions. Comparisons of modeled changes in bed elevation to changes measured by consecutive multi-beam surveys spanning four 1- to 2-year intervals shows that in general, the model simulates a much more stable sediment bed than was actually observed in bathymetric surveys. For example, Figures 65 and 66 compare modeled changes in bed elevations to changes measured by multi-beam surveys and show that modeled changes in elevation are much smaller than actual changes (excepting the time period from 2010 to 2011, which included the flow associated with Hurricane Irene). Although the data indicate a striking empirical finding about areas of local deposition following Hurricane Irene, those data do not validate the models' predictions of recovery at the scale of model cells over more representative periods. Model-data comparisons from the long-term calibration provide a more appropriate test of the accuracy of the models' simulations of recovery. This model limitation should be noted in the main body of the RI text (See Comment #41).

No.	Section	General or Specific	Page No.	EPA Comment
96	Appendix M	General	N/A	The models are not able to accurately distinguish between locations of erosion and sedimentation. Appendix M Figures 61 through 64 show bathymetric changes as measured by multi-beam bathymetric survey for 2007-2008, 2008-2010, 2010-2011, and 2011-2012, alongside modeled changes for the same periods. These figures demonstrate a weak match between measured and modeled elevation change by model cell. Only the 2010-2011 comparisons (including Hurricane Irene) in Figure 63 show color patterns that are visually similar for model and data. The uncertainty associated with the models' ability to predict areas of erosion and sedimentation should be included in main body of the report (See Comment #41).
97	Appendix M, Attachment B	General	N/A	Attachment B to Appendix M contains numerous references to Appendix A and B. Please add a clarification that these are references to appendices to Attachment B of Appendix M, and not appendices to the main RI report.
98	Appendix N	General	N/A	When CPG updates the suite of LPR models based on the collection of any additional data, EPA recommends that the AOC model adopts the bed structure, erosion, and deposition used in the CFT model. Given the simpler approach to modeling organic carbon this should be a relatively easy change to make and would eliminate one of the two differences in bed structure moving from the HST to AOC to CFT models.
99	Appendix N	General	N/A	Appendix N refers to the organic carbon model as AOC and Section 7 refers to it as OC. Please revise the references in Appendix N to be consistent with RI Section 7.
100	Appendix N	General	N/A	References to SWEM in the text and associated figures should be changed back to ST-SWEM, consistent with the Lower 8.3 Mile ROD (e.g. in Section 2.5, page 11, second paragraph, fourth sentence).
101	Appendix O (and former Appendix K)	General	N/A	The RTCs on the 2015 Draft RI, Comment #407 states: "…the requested figures are enclosed: the probability distribution for dry-weight, OC-normalized and cohesive solids-normalized concentrations are attached as Figures 1 through 3, respectively. The corresponding crossplots are shown in Figures 4 through 6. They can be added to the final report if necessary." In addition, the RTC on the 2015 Draft RI, Comment #562 references "Figure 7 of attachment". The referenced attachments and figures could not be located. Please provide these items or identify when they will be provided.
102	Appendix O	General	N/A	In the RTCs on the 2015 Draft RI, the CPG has stated that comments or portions of comments 537, 538, and 553 will be addressed by future deliverables. Those items are still outstanding. These comments are summarized below to ensure they will be addressed: a) Former Comment #537: Results of each of the model sensitivity analyses discussed in the RI Report should be presented in figures and tables for comparison to the chosen set of calibration parameters. The CPG has indicated that "the model sensitivity analysis is deferred to a subsequent deliverable along with secondary COPCs". b) Former Comment #538: Please revise Section 2.1.1 to present model results for a longer-duration run (1995-2013) with and without the fluff layer incorporated to demonstrate how the fluff layer impacts the model results. The CPG has indicated that "the requested no-fluff-layer run will be incorporated into the sensitivity analysis, the content of which is being worked out with EPA. The sensitivity analysis will be provided in a follow-up deliverable". c) Former Comment #553: The text in Section 3.1 states that 2010 mapping was used for 1995 initial conditions outside the RM 1 to RM 7 reach. However, model inputs received from the CPG in December 2014 indicate that there were a number of grid cells outside the RM 1 to RM 7 reach where sediment initial concentrations for 1995 were not equal to sediment initial concentrations for 2010. This comment has been partially addressed with the bed IC "scale-up" factor of 1.5. However, the CPG has also noted that "the 1995 and 2010 ICs differ in a portion of Newark Bay, as described in Appendix O Attachment 1 (see Table 1). As discussed, an addendum on the Newark Bay portion of the domain will be provided to EPA".
103	Appendix O	General	N/A	The Contaminant Fate and Transport model (CFTM) also under-predicts contaminant concentrations in areas modeled as depositional and over-predicts concentrations in areas modeled as erosional. As a consequence, surface sediment recovery is overstated. The text states, "the chemical data show recovery for all COPCs in highly depositional areas" and also that the "CFT model predicts the relative trends between those representative regimes as estimated." However, the chemical data show little apparent recovery in median concentrations from 1995 to 2009 for 2,3,7,8-TCDD and weak recovery for Tetra-CB in strongly depositional model cells (mean chemical concentrations show better recovery). Data and figures presented in Appendix O show that the model does not closely match contaminant data trends by erosion/deposition regime and predicts recovery in excess of actual declines in concentration, especially in areas deemed to be strongly depositional based on modeling. The main body of the report should acknowledge differences between empirical data that show less declines in chemical concentrations than model simulations that show more recovery in a discussion of model uncertainty (See Comment #41).

No.	Section	General or Specific	Page No.	EPA Comment
104	App J, Table 2-1	Specific	N/A	Please add a note that specifies the depth ranges for layers A through E. They are defined in Section 2.3, but the table is referenced earlier.
105	App J, Section 2.1, Page 3, sentence below Equation 1 box.	Specific	3	Revise the text as follows: "The values for *b* and *m* vary depending on the ***total PCB*** concentration range…" ***(emphasis added to identify requested change)*** The tetra-PCB concentration is unknown in this case so total PCB values must be used to determine b and m.
106	App J, Section 2.2, page 3	Specific	3	Please revise this section to use units of inches throughout and present units of feet in parentheses. Also provide greater detail on how the weighting was done when the bottom of the last core segment considered extended beyond 6 inches, or the bottom of the last core segment considered extended less than 6 inches.
107	App J, Section 2.3, Page 3, first paragraph and Table 2-1	Specific	3	The text states: "Subsurface mapping was conducted for five layers: B: 0.5 to 1.5 feet, C: 1.5 to 2.5 feet, D: 2.5 to 3.5 feet, E: 3.5 to 5.5 feet, and F: below 5.5 feet. These depth intervals were chosen because they corresponded with the most common segmentation scheme in the datasets used." Table 2-1 does not list layer F. Please revise the table or text accordingly.
108	App J, Section 2.3.1	Specific	3	Please clarify the purpose of the interpolation of Layer F. If the values presented were used to estimate chemical mass inventory presented in RI Section 6, please add that reference here. Also, the text suggests that the CPG intends to simulate a deep dredging scenario similar to the Lower 8.3 Mile FFS. If that is not the case please revise this text to identify the purpose of the Layer F concentration map (e.g., to model dredge release for the channel portion of the Lower 8.3 Mile ROD, where dredging will extend deeper than 5.5 feet).
109	App J, Section 3.1, Page 6, last paragraph, second sentence	Specific	6	Please change "Figure 3.3" to "Figure 3-3" for the consistency.
110	App J, Section 3.3, Page 9, second full paragraph	Specific	9	Please change "Statin Island" to "Staten Island".
111	App J, Section 5.2.2.2, page 17, second sentence	Specific	17	Please clarify what statistical test was done to determine if the confidence limits on the residual variances overlapped significantly.

112	App J, Section 5.4, page 20, last paragraph, last sentence	Specific	20	Please provide a table that identifies for each chemical:
				• the cap value
				• the maximum predicted value before capping
				  o for map 37
				  o the range across the maps
				• the fraction of the area capped
				  o for map 37
				  o the range across the maps
				• the floor values
				• the minimum predicted value before bottoming-out
				  o for map 37
				  o the range across the maps
				• the fraction of the area bottomed-out
				  o for map 37
				  o the range across the maps
				If the floor values were influence by non-detects please note that and provide additional detail on the influence of detection limits on the floor value chosen.

113	App J, Section 6.2, page 23, second sentence	Specific	23	The text references Figures 5-16 and 5-17, which do not exist in the Appendix J Tables and Figures file. Please revise the text or add the figures.
114	App L, Section 1.0, first paragraph, last sentence	Specific	9	HQI, 2006a and 2006b are cited in text, but are not included in the references section. Please add these references.
115	App L, Section 2.1, second paragraph, second sentence	Specific	10	The text cites Simons, 1964, but in the References section it is shown as Simons, 1974. Please correct.
116	App L, Section 2.1.2, first new paragraph, third and fourth sentences	Specific	12	Please correct the "Error! Reference source not found" messages associated with the Figures 2-9 and 2-10 references.
117	App L, Section 4.0, first paragraph, third sentence	Specific	67	Please define "HD".
118	App L, Section 6.4, Figure 6-19	Specific	112	Please define "HWS" and "LWS" in the figure legend.
119	App L, Section 7.0, first paragraph, fourth sentence	Specific	113	Please correct the phrase "the model was subsequently been refined…".

No.	Section	General or Specific	Page No.	EPA Comment
120	App L, Section 7.0, second paragraph, third sentence	Specific	113	Please correct the phrase "The model performance was against data…".
121	App M, Section 5.4.6, paragraph 1, tenth sentence	Specific	70	Please delete the first "approximately" in the sentence, "In contrast, the model-data comparisons over 2008-2010 show the biggest discrepancy, with the data showing approximately erosion over approximately half the domain and deposition over the remaining area.".
122	App M, Section 5.5, second paragraph, first sentence	Specific	74	Please change "atleast" to "at least".
123	App M, Section 5.5, first paragraph, last sentences	Specific	74	Please delete the spaces in "influe nce".
124	App M, Section 5.5, third paragraph, first sentences	Specific	74	Please rearrange the phrase "with respect to both cohesive and non-cohesive sediments (clays and silts)…" to associate silts and clays with cohesive sediments.
125	App M, Attachment B, Section 2.0, first new paragraph, fourth sentence	Specific	14	The beginning of the sentence, "Examined relative to the river flows between individual surveys, shows that both depositional periods did not include any river flows in excess of 6000-7000 cfs,…" should be edited, for example, "Examination of bathymetric differences relative to the river flows … shows…"
126	App M, Attachment C, Section C.7, second paragraph, sixth sentence	Specific	9	Please change the word "relative" to "relatively".
127	App N, Section 2	Specific	None	Please add a section similar to Appendix O, Section 2.1.5 that describes how navigation scour was handled in the OC model.
128	App N, Section 2.5, second paragraph, third sentence	Specific	11	Please clarify this sentence. Neither the mass nor the fractions of cohesive and non-cohesive solids within a layer should change with consolidation.
129	App N, Section 3.0, first paragraph, last sentence	Specific	13	Correct the statement that begins "It is meant at identifying differences…".
130	App N, Section 3.2, second paragraph, first sentence and Figures 2 through 15	Specific	14	Replace "labelled 'HQI'" with "labeled ST-SWEM" and correct the labels on Figures 2 through 15 to reference "ST-SWEM". Replace all other instances of "labelled" with "labeled".
131	App N, Section 3.2, second paragraph, third sentence	Specific	14	Replace "till" with "until".
132	App N, Section 3.3, last paragraph on page, first sentence	Specific	15	Replace "RM 9-8" with "RM 0-8".
133	App N, Section 3.4, first paragraph, second sentence	Specific	16	While it is correct that "SWEM calculates a temperature-dependent (i.e., seasonal) particle mixing rate", neither the EPA nor the CPG RCATOX model applications use the particle mixing rate calculated by ST-SWEM. Please clarify this in the discussion of the model test done for Appendix N.
134	App N, Section 3.4, first paragraph, last sentence	Specific	16	Please present the mixing rate in units of cm^2/year consistent with the values presented in Appendix O.
135	App N, Section 3.4, second paragraph, last sentence	Specific	16	Please clarify this sentence. Recommend stating "In the contaminant model, higher particle mixing rates are expected to reduce contaminant concentration gradients across the individual layers that make up the active layer of the model."
136	App N, Section 4	Specific	18	Please provide the parallel analyses for Newark Bay in this document or a subsequent addendum. The presentation should include Section 4.2 Initial Conditions, and Section 4.4.4 DOC.
137	App N, Section 4.3, first paragraph, first sentence	Specific	20	The Saddle River is listed twice. Please revise the text.
138	App N, Section 4.3.3, last sentence	Specific	21	Please clarify that the loads were calculated using time variable flows paired with the constant detrital OC concentrations used for storm water outfalls.
139	App N, Section 5	Specific	24 to 29	Please replace "calibration" with "validation" or "verification" throughout this section as no attempt was made to calibrate the model.
140	App N, Section 5.1 title	Specific	24	Replace "calibration metrics" with "validation/verification targets or variables".
141	App N, Section 5.4.1, last paragraph, first sentence	Specific	25	Please correct the second instance of "Figure 27 and Figure 28" to read "Figure 25 and Figure 26".
142	App N, Section 5.4.2 and Figures 30 through 34	Specific	26 to 28	The predicted POC appears to be biased high transitioning from the mouth of the Passaic into Newark Bay. Additional plots showing the comparison between model and data for Newark Bay and potentially the Hackensack River would be informative. Please expand the discussion to recognize this bias, potential sources of the bias (e.g. bias in predicted solids App M Figure 60), and implications to the subsequent CFT model.

No.	Section	General or Specific	Page No.	EPA Comment
143	App N, Section 5.4.3, first paragraph, second sentence	Specific	28	Please clarify the statement "limited availability of bed f_{OC} data". There is more bed f_{OC} data than any of the other parameters discussed in the report.
144	App N, Section 5.4.3, first full paragraph, third sentence	Specific	29	The HST model is intended to represent inorganic sand and cohesive fines. In the Housatonic River, sediments were fractionated by size and f_{OC} measured on the subsamples (Weston 2004a). In the portion of the river characterized by coarse sediments, f_{OC} directly measured on non-cohesive particles averaged approximately 0.3%. Scanning electron microscopy analyses of Housatonic River quartz particles showed only blotchy organic films or coatings (Weston 2004b). In the muddier portions of the Housatonic River, the f_{OC} of the larger particles was over 10% in many cases; however, this was attributed to large pieces of organic matter, including sticks and leaves. Sediment profile images (Germano & Associates 2005) of the LPR confirm the presence of macro-organic material, but this material typically has lower particle densities and behaves differently than the large sand particles represented in the model. Organic carbon concentrations on inorganic sand particles would likely be more than an order of magnitude smaller than on cohesive particles. Spatial variability in cohesive solids fractions likely contributes to the variability of f_{OC} of bulk sediment (Figure 37, bottom panel), although fewer grain size data (compared to f_{OC}) limits the opportunity to confirm this hypothesis. Please revise this discussion to consider other potential sources of the changes in the apparent f_{OC}.
145	App N, Section 5.4.3, second full paragraph, first sentence	Specific	29	Revise the text to recognize that the small change in the archive layer is largely due to its large volume and relatively small changes due to erosion and deposition.
146	App N, Section 5.4.3, last paragraph and Figure 39	Specific	29	Please provide additional detail describing why the initial conditions are stratified into only a few levels and show far less variability than the data. It appears that this is due to the combination of the limited number of ECOMSEDZLJS cores in the HST model (each with a specific fraction cohesive) and the function presented in Figure 20. If this is the case, please provide details either here in the description of Figure 39 or in Section 4.2.
147	App N, Section 5.4.3, last paragraph, last sentence	Specific	29	Refer to Comment #143. It is likely that the data in the stretch of the river above RM 12 are biased towards pockets of fines within coarser areas at a scale that the model grid cannot capture.
148	App N, Figures 27 through 29	Specific	N/A	Revise these figures to use a logarithmic scale for the Y-Axis.
149	App N, Figures 35 and 36	Specific	N/A	Please add some guide lines to these figures (e.g. 10% f_{OC}) to allow easier comparison between panels. The model appears to predict a slightly higher f_{OC} than the data in the water column. In addition, the model slope appears steeper than the data predicting less of a reduction in f_{OC} at higher solids concentrations than suggested by the data. Please expand the discussion to recognize this behavior, potential sources of the differences, and implications to the subsequent CFT model.
150	App O, Section 1, first partial sentence	Specific	2	Revise "and no correlation among selected COPC congeners" to be "and ***poor*** correlation among selected COPC congeners". ***(emphasis added to identify requested change)*** This is where it is important to point out greater detail on the selection of COPCs to be modeled (i.e. many of the COPCs that were not modeled can be correlated to the subset of COPCs that were modeled). See Comment #37.
151	App O, Section 1, first full paragraph, first sentence	Specific	2	Delete the number 48. The 2006 MWP did not identify 48 COPCs. The FFS modeled 48 COPCs. There were 29 COPCs identified for initial calibration and many more than 48 if you consider the full list of COPCs/COPC groups identified in the MWP.
152	App O, Section 2.1.1.1.1, net deposition and erosion Equations	Specific	6 to 7	At first glance the sub-bullets may appear as minus symbols. Revise the sub-bullets for clarity.
153	App O, Section 2.1.6	Specific	22	The list of modifications to the model includes items that were directed by the EPA, items that were done in collaboration with the EPA, and items that were initiated by the CPG. Revise the list to clarify the items initiated by the CPG, and particularly, items that differ or do not differ from code used in the OU2 ROD simulations. For example, contrary to what the fifth bullet suggests, the ROD simulations had dredging solids and POC releases handled in the ST-SWEM and ECOM-SEDZLJS models respectively, and the CFT model used the values computed by the preceding models.
154	App O, Section 3, first paragraph	Specific	23	For clarity, it is recommended that the layers be described in order from top to bottom. E.g., "The sediment is modeled using a fluff layer of variable thickness (1 mm or less) when present, overlying a variable thickness surface layer (0.5 to 2.0 cm thick), followed by 1 to 106 1-cm bed layers, with an underlying deep bed layer (≥ 0 cm thick, initially 60 cm)."
155	App O, Section 3.1, second paragraph, third sentence	Specific	23	This is the only reference to "Layer F" that still exists in Appendix O with no explanation of how it was generated or what purpose it serves. It is not input into the model and is not used in the calibration simulations but is based on the RI data and relevant to all FS simulations. Maps of "Layer F" concentrations were presented in the 2015 Draft RI Appendix O but have been removed from the current version. Please provide additional details here or provide a reference to the description of Layer F in Appendix J.
156	App O, Section 3.1, second paragraph, sixth sentence	Specific	23	Add text that recognizes that the CFT model could not be run for all 100 maps, and that the selected map represents one of many maps near the central tendency of the distribution of RM 0 to 14.7 SWACs.

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157	App O, Section 3.1, third bullet	Specific	24	The reference to "j coordinates greater than 113" should be expanded upon. This point of reference would not make sense to anyone outside the modeling teams. It is recommended that the CPG reference a landmark such as the Eastern Spur of the NJ Turnpike and re-insert Figure 3-5 from the 2015 Draft of Appendix O.
158	App O, Section 4.2.1, first paragraph, first sentence	Specific	34	Correct the reference "SSRS ; see Section 4.2". SSRS is not mentioned in section 4.2.
159	App O, Section 4.2.1 and Figure 4.2.1	Specific	34	Provide an updated table of datasets similar to Appendix J, Table 2-1 that that indicates the three-time horizons used in the model-data comparisons (1995 to 1999, 2005 to 2013 pre-Irene, and the 2005 to 2013 post Irene). When discussing figures that present those datasets separately, discuss how the model compares to each of those groups of data separately.
160	App O, Section 4.2.1, second paragraph	Specific	34	Please provide additional discussion of the potential sources for the observed over- and under-predictions in Figures 4.2.1-1a through 4.2.1-1f (See Comment #103).
161	App O, Section 4.2.1, first full paragraph, last sentence	Specific	35	Revise this sentence to identify more clearly that it is discussing the trends in the means on these figures (i.e. "The trends ***in the means*** in this region") ***(emphasis added to identify requested change)***. Looking at the box and whisker medians and inner quartile does not support the same conclusions in some cases.
162	App O, Section 4.2.3, second paragraph after bullets, last sentence	Specific	38	Provide a more complete description of how the SSRS is calculated.
163	App O, Section 4.2.3, footnote 10	Specific	40	Delete this footnote and report the FFS values for 1,2,3,4,6,7,8-HpCDF in the same fashion as 2,3,7,8-TCDD and tetra-PCB.
164	App O, Section 4.2.4, first partial paragraph, last two sentences	Specific	41	Although many of the points fall within the scatter of the data presented on Figures 4.2.4-2, the majority of the points do not. Please revise this description to provide a more balanced interpretation of these figures recognizing the limited amount of available data.
165	App O, Section 4.2.4, first partial paragraph, last sentence	Specific	41	Delete the first instance of "available".
166	App O, Section 4.3.2, second full paragraph and Figure 4.3.2-7	Specific	43	Identify if the results discussed here and presented in the figures are a combination of the long and short term calibrations.
167	App O, Section 4.3.4, second full paragraph, last sentence	Specific	45	Revise "TTR2/T042 (20)" to "TTR2/T042 (***2.0***)" if table 4-3 is correct. ***(emphasis added to identify requested change)***
168	App O, Section 4.3.4, footnote 11	Specific	46	Delete this footnote and report the FFS values for 1,2,3,4,6,7,8-HpCDF in the text as was done for 2,3,7,8-TCDD and tetra-PCB.
169	App O, Section 4.3.5, second paragraph, first two sentences	Specific	46	Given the magnitude of particle mixing relative to diffusive mixing, the fluff bed exchange must be dominated by particle mixing. Particle mixing is not a chemical specific parameter and therefore the discussion should be revised to reflect that varying the fluff-bed mixing rate by chemical would not have been considered an acceptable calibration approach.
170	App O, Section 4.3.5, second paragraph, last sentence	Specific	46	The fact that the fluff layer was calibrated to support the CPG's conceptual model does not mean that it is consistent with the behavior of the system. The limited finely segmented surficial sediment data suggest that the top few centimeters of the bed generally are consistent with particulate concentrations in the water column. Revise the text to reflect that the calibrated long-term sediment and short-term water column results are a function of the assumed mixing between the fluff and the bed, the magnitude of the mixing within the bed, and the assumed profile of mixing within the bed. There are likely other combinations of these parameters that would provide similar calibration results. This is especially true given the limited data available to define the profile of concentrations from the water column through the fluff layer and down half a foot into the sediment bed.
171	App O, Section 4.3.5, fourth complete sentence and Figure 4.3.5-1	Specific	47	It is not clear what Figure 4.3.5-1 represents relative to the behavior of the fluff layer. It does not present any information on mixing, and the minima on the Y AXIS is a factor of 10 greater than the maximum fluff layer thickness. Please expand on the discussion of how this figure is relevant or remove it from the Appendix.
172	App O, Section 4.3.5, last paragraph	Specific	47	This description recognizes the non-uniqueness of the fluff layer parameterization used, but it should be expanded to discuss that the calibrated value of the fluff exchange is strongly influenced by the assumed shape and calibrated magnitude of mixing within the bed. The under-prediction of concentrations in depositional areas suggests that the model may not be supplying sufficient chemical mass to the water column. The text should recognize this source of uncertainty, and future revisions to the model based upon pre-design data should attempt to address this uncertainty (See Comment #103).
173	App O, Figure 2-5	Specific	N/A	Please move the transferred mass below the active mass in the bottom right panel.
174	App O, Figure 3-3	Specific	N/A	Adjust the scales on the McDonald, Third, and Second River panels.

EPA COMMENTS

Lower Passaic River Study Area Remedial Investigation/Feasibility Study, Remedial Investigation Report Sections 7 and 10 and Appendix J, L, M, and N (dated January 2018) and Section 6 and Appendix O (dated February 2018)

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175	App O, Attachment 1	Specific	N/A	Add additional information to the Table of Contents to indicate which of these maps were used for the model initial conditions for the reach between RM 0 and 14.7, for each layer, for each chemical. This information is provided in Table 1, but it would be good to repeat that information so that it is clear to the reader. A footnote added to Figures 2, 4, and 5 through 14, indicating that they are the values used in the model, would clarify which figures are superseded and which are used.

N/A – not applicable